

PATENT APPLICATION No. 10/661,465
Applicants: Franco Vitaliano and Gordana Vitaliano
Amendments to the Claims

Claims

1. 1. (Original): A quantum information processing element comprising
2 a cage defining a cavity formed from a plurality of self-assembling protein molecules,
3 and
4 one or more cargo elements located within the cavity, wherein at least one of the cargo
5 elements comprises a qubit programmable into a plurality of logical states.
1. 2. (Original): A quantum information processing element according to claim 1, comprising
2 receptors for capturing and positioning one or more cargo elements within the cavity.
1. 3. (Original): A quantum information processing element according to claim 2, comprising
2 a vesicle located within the cage and enclosing one or more cargo elements, wherein the
3 receptors extend through the vesicle to capture and position a cargo element within the vesicle.
1. 4. (Original): A quantum information processing element according to claim 3, comprising
2 adaptors disposed between the receptors and the cage and binding to the receptors.
1. 5. (Original): A quantum information processing element according to claim 1, comprising
2 a vesicle located within the cage and enclosing the one or more cargo elements.
1. 6. (Original): A quantum information processing element according to claim 1, comprising
2 molecular tethers for capturing and positioning one or more cargo elements within the cavity.
1. 7. (Original): A quantum information processing element according to claim 1, comprising
2 direct cage bonding for capturing and positioning one or more cargo elements within the
3 cavity.
1. 8. (New): A quantum information processing element according to claim 1, comprising
2 a functionalized cage for attaching one or more elements externally to the cage.
1. 9. (Original): A quantum information processing element according to claim 1, comprising
2 receptors, molecular tethers and direct cage bonding for capturing and positioning one or more
3 cargo elements within the cavity.
1. 10. (Original): A quantum information processing element according to claim 1, comprising
2 one or more cargo elements forming a non-permeable cavity.

- 1 11. (Original): A quantum information processing element according to claim 3, comprising
- 2 a vesicle forming a non-permeable cavity.
- 1 12. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling cage that is electrically neutral and inhibits charge transfer between the cage
- 3 and its enclosed cargo elements.
- 1 13. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling cage that reduces the tendency of a plurality of logical states in a coherent state
- 3 to collapse into a decoherent state.
- 1 14. (Original): A quantum information processing element according to claim 1, comprising
- 2 a non-qubit-only cage that inhibits non-quantum information processing cargo elements from
- 3 interfering with qubit cargo element operation in other cages.
- 1 15. (Original): A quantum information processing element according to claim 3, comprising
- 2 a self-assembling vesicle that is electrically neutral and inhibits charge transfer between the
- 3 vesicle and its enclosed cargo elements.
- 1 16. (Original): A quantum information processing element according to claim 3, comprising
- 2 a self-assembling insulative vesicle that reduces the tendency of a plurality of logical states in a
- 3 coherent state to collapse into a decoherent state.
- 1 17. (Original): A quantum information processing element according to claim 4, comprising
- 2 self-assembling receptors and adaptors that are electrically neutral and inhibit charge transfer
- 3 between the vesicle and cage and their enclosed cargo elements.
- 1 18. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling cage that reduces contaminant background radiation to cargo carried within the
- 3 cage.
- 1 19. (Original): A quantum information processing element according to claim 3, comprising
- 2 a self-assembling vesicle that reduces contaminant background radiation to cargo carried within
- 3 the vesicle.
- 1 20. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling framework of cages to structurally support one or more self-assembling QIP
- 3 elements.

- 1 21. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling electrically neutral substrate of cages to structurally support one or more self-
- 3 assembling QIP elements.
- 1 22. (Original): A quantum information processing element according to claim 1, comprising
- 2 a self-assembling framework of cages to structurally order one or more self-aligning QIP
- 3 elements.
- 1 23. (Original): A quantum information processing element according to claim 1, wherein a
- 2 cage is empty and includes no cargo elements.
- 1 24. (Original): A quantum information processing element according to claim 1, wherein the
- 2 one or more cargo elements is a single cargo element comprising a qubit programmable into a
- 3 plurality of logical states.
- 1 25. (Original): A quantum information processing element according to claim 1, wherein the
- 2 one or more cargo elements are a plurality of cargo elements.
- 1 26. (Original): A quantum information processing element according to claim 24, wherein
- 2 the plurality of cargo elements are qubits programmable into a plurality of logical states.
- 1 27. (Original): A quantum information processing element according to claim 24, wherein at
- 2 least some of the plurality of cargo elements are quantum information processing cargo elements
- 1 28. (Original): A quantum information processing element according to claim 24, wherein at
- 2 least some of the plurality of cargo elements are non-quantum information processing cargo
- 3 elements.
- 1 29. (Currently amended): A quantum information processing element according to claim 1,
- 2 wherein the cargo elements respond to stimuli internal and or external to the cage.
- 1 30. (Currently amended): A quantum information processing element according to claim 3,
- 2 wherein a vesicle and its contained cargo elements respond to stimuli internal and or external to
- 3 the vesicle.
- 1 31. (Currently amended): A quantum information processing element according to claim 24,
- 2 wherein a subset of the non-quantum information processing cargo elements include one or more
- 3 therapeutic single task and or multitask in vivo and or in vitro agents.
- 1 32. (Withdrawn):
- 1 33. (Withdrawn):
- 1 34. (Withdrawn):

1 35. (Original): A quantum information processing element according to claim 24, wherein a
2 subset of qubit and non-quantum information processing cargo elements include one or more
3 quantum dots.

1 36. (Original): A quantum information processing element according to claim 24, wherein a
2 subset of the cargo elements include one or more photonic dots.

1 37. (Original): A quantum information processing element according to claim 24, wherein a
2 subset of the cargo elements include one or more liquids without dopants or with one or more
3 dopants of any suitable type.

1 38. (Original): A quantum information processing element according to claim 24, wherein a
2 subset of the cargo elements include a gas or vapor without dopants or with one or more dopants
3 of any suitable type.

1 39. (Original): A quantum information processing element according to claim 1, wherein one
2 or more qubit cargo elements are programmed by one or more pulses of electromagnetic
3 radiation.

1 40. (Withdrawn):

1 41. (Withdrawn):

1 42. (Withdrawn):

1 43. (Currently amended): A quantum information processing element according to claim 1,
2 wherein the qubit ~~includes an unpaired electron~~ and the plurality of logical states of the qubit are
3 defined by ~~electron~~ one or more spin polarization properties and or attributes.

1 44. (Withdrawn):

1 45. (Withdrawn):

1 46. (Currently amended): A quantum information processing element according to claim 1,
2 wherein the qubit includes a ~~nitroxide molecule~~ one or more species of molecules.

1 47. (Withdrawn)

1 48. (Original): A quantum information processing element according to claim 1, wherein the
2 qubit is photon-based and the plurality of logical states of the photon-based qubit include a
3 coherent logical state.

1 49. (Original): A quantum information processing element according to claim 1, wherein the
2 plurality of logical states includes a coherent state.

- 1 50. (Original): A quantum information processing element according to claim 1, wherein the
- 2 plurality of logical states includes a coherent state at room temperature.
- 1 51. (Original): A quantum information processing element according to claim 1, wherein the
- 2 self-assembling protein molecule is a clathrin molecule.
- 1 52. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage comprises self-assembling synthetic protein molecules.
- 1 53. (Currently amended): A quantum information processing element according to claim 4,
- 2 wherein receptors, adaptors, and vesicle comprise natural and or synthetic protein molecules.
- 1 54. (Currently amended): A quantum information processing element according to claim 1,
- 2 comprising a ~~metallie~~ coating of one or more materials on part or the entirety of the cage.
- 1 55. (Currently amended): A quantum information processing element according to claim 4,
- 2 comprising a ~~metallie~~ coating of one or more materials on a portion or an entirety of the
- 3 receptors, adaptors, and vesicle.
- 1 56. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage is substantially greater than one nanometer in diameter.
- 1 57. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage is at least about 50 nanometers in diameter.
- 1 58. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage is at least about 100 nanometers in diameter.
- 1 59. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage is symmetric with respect to a plane.
- 1 60. (Original): A quantum information processing element according to claim 1, wherein the
- 2 cage has icosahedral geometry.
- 1 61. (Original): A quantum information processing element according to claim 1, wherein
- 2 qubits are linearly positioned at vertices along a single plane using circulant ordering.
- 1 62. (Original): A quantum information processing element according to claim 1, wherein
- 2 multiple quantum information processing elements are physically linked together.
- 1 63. (Currently amended): A quantum information processing element according to claim 1,
- 2 wherein multiple self-assembling QIP elements are functionally linked together, ~~either~~ locally
- 3 and or at a distance.

- 1 64. (Currently amended): A quantum information processing element according to claim 1,
- 2 wherein the quantum information processing element forms a hybrid system upon its physical
- 3 and or functional integration with non-invention elements in vitro and or in vivo.
- 1 65. (Original): A method for forming a quantum information processing element comprising
- 2 forming from self-assembling protein molecules a cage defining a cavity, and locating
- 3 one or more cargo elements within the cavity, wherein
- 4 at least one of the cargo elements comprises a qubit programmable into a plurality of
- 5 logical states.